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Proceedings Series 2010/046 | **Compte rendu 2010/046**

Proceedings of the Central and Arctic Regional Advisory Process on the Status of Cambridge Bay Anadromous Arctic Char Stocks

27-28 January, 2010
Arctic Island Lodge
Cambridge Bay, NU

T. Carmichael
Meeting Chair

L.N. Harris
Editor

Compte rendu du processus de consultation scientifique régional du Centre et de l'Arctique concernant l'état des stocks d'omble chevalier anadrome de la baie Cambridge

Les 27 et 28 janvier 2010
Arctic Island Lodge,
Cambridge Bay, NU

T. Carmichael
Président de la reunion

L.N. Harris
Rédacteur

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November 2010 | **Novembre 2010**

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made at the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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ISSN 1701-1272 (Printed / Imprimé)
ISSN 1701-1280 (Online / En ligne)

Published and available free from:
Une publication gratuite de :

Fisheries and Oceans Canada / Pêches et Océans Canada
Canadian Science Advisory Secretariat / Secrétariat canadien de consultation scientifique
200, rue Kent Street
Ottawa, Ontario
K1A 0E6

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Correct citation for this publication:

DFO. 2010. Proceedings of the Central and Arctic Regional Advisory Process on the Status of Cambridge Bay Anadromous Arctic Char Stocks; 27-28 January 2010. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2010/046.

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SUMMARY

A Fisheries and Oceans Canada (DFO) regional science advisory meeting took place on January 27-28, 2010, in Cambridge Bay, NU, to assess anadromous Arctic Char (*Salvenius alpinus*) stocks in the area. This meeting was held in response to a request from DFO Fisheries and Aquaculture Management (FAM) sector for science advice on the current status and sustainable harvest level for the Cambridge Bay commercial fishery. These Arctic Char stocks were last assessed in 2004. Since that time, new information and data have become available, so a new assessment was warranted. Meeting participants included DFO Science and FAM sectors, the Ekaluktutiak Hunters and Trappers Organization (HTO) and Kitikmeot Foods. Status, trends and sustainable harvest rates of the Cambridge Bay Arctic Char stocks were assessed. Participants agreed with the findings that, for the most part, Cambridge Bay commercial stocks are stable and fished at or below their sustainable rates of harvest. All of the primary stock complexes were considered to be at low risk of over exploitation under current harvest regimes, with the exception of the Ellice River stock complex. The Ellice River stock demonstrated a consistent decline in modal age, a consistent increase in mean condition factor and round weight and a faster growth rate, which differed from those trends observed in other fisheries, thus was considered to have a moderate risk of over exploitation. Further research is required for collection and analysis of catch per unit of effort data (CPUE), bycatch data and standardization of weir and gillnet effort. Models such as virtual population analysis and surplus biomass should be used, once CPUE data has been collected, to estimate abundance and a total allowable catch (TAC) and to estimate limit reference points for a Precautionary Approach (PA) model. Science advice resulting from the meeting is published in the DFO Canadian Science Advisory Secretariat (CSAS) Science Advisory report series and the supporting data analyses are published in the Research Document series.

SOMMAIRE

Pêches et Océans Canada (MPO) a tenu une réunion de consultation scientifique régionale les 27 et 28 janvier 2010 à Cambridge Bay, NU, afin d'évaluer les stocks d'omble chevalier anadrome (*Salvenius alpinus*) présents dans le secteur. Cette réunion a été organisée en raison de la demande d'avis scientifique du secteur de la Gestion des pêches et de l'aquaculture concernant l'état actuel de la pêche commerciale pratiquée dans la baie Cambridge et les prélèvements durables pour cette pêche. Ces stocks d'omble chevalier avaient été évalués pour la dernière fois en 2004. Depuis, de nouvelles informations et de nouvelles données sont disponibles, ce qui justifie la réalisation d'une nouvelle évaluation. Parmi les participants à la réunion, mentionnons des représentants des secteurs des Sciences et de GPA du MPO, de la Ekaluktutiak Hunters and Trappers Organization (HTO) et de Kitikmeot Foods. On a évalué l'état, les tendances et les prélèvements durables concernant les stocks d'omble chevalier de la baie Cambridge. Les participants se sont entendus sur le fait que, dans la majorité des cas, les stocks qu'exploite la pêche commerciale dans la baie Cambridge sont stables et que les prises sont égales ou inférieures aux prélèvements durables. On considère que l'ensemble des complexes de stocks principaux, sauf le complexe de stocks de la rivière Ellice, affichent un faible risque de surexploitation selon les régimes de prélèvement actuels. Le stock de la rivière Ellice affiche cependant un déclin régulier de l'âge modal, une augmentation régulière du coefficient de condition moyen et du poids brut ainsi qu'un taux de croissance plus élevé, ce qui est différent des tendances observées dans les autres pêches. Le risque de surexploitation y est donc considéré comme étant modéré. Il faut effectuer d'autres recherches afin de recueillir et d'analyser des données sur les prises par unité d'effort (PUE) ainsi que sur les prises accessoires, et l'effort de pêche à la fascine ou au filet maillant doit être normalisé. Des modèles, comme celui de l'analyse de la population virtuelle ou de la biomasse excédentaire, devront être utilisés lorsque des données sur les PUE seront disponibles afin que l'on puisse estimer l'abondance et le total autorisé des captures (TAC) ainsi que des points de référence limites pour un modèle intégrant l'approche de précaution. L'avis scientifique découlant de cette réunion est publié dans la série des avis scientifiques du Secrétariat canadien de consultation scientifique du MPO (SCCS), tandis que les analyses des données à l'appui sont publiées dans la série des documents de recherche.

INTRODUCTION

Cambridge Bay Arctic Char stocks have a long history of both subsistence and commercial harvest. Commercial fishing for Arctic Char first began in Cambridge Bay in 1960 (Day and de March 2004). Given extremely successful plant sampling and fishery monitoring programs in the area, a great deal of harvest and population parameter data are available. Using the data collected as part of the plant sampling program, the fishery was last evaluated in 2004 to determine the effects of fishing on Arctic Char stocks in the area (Day and de March 2004). The 2004 assessment included six fisheries and revealed the Cambridge Bay fishery and its supportive stocks were likely stable and being fished at or below their sustainable rates of harvest. All of the primary stock complexes, with the exception of the Ellice River stock complex, were considered to have a low to moderate risk of over exploitation under current harvest regimes.

The purpose of this meeting, as described in the Terms of Reference (Appendix 1), was to assess the current status of, and sustainable harvest level for, the Cambridge Bay commercial fishery, taking into consideration the new data information available since the last assessment (2004). Meeting participants (Appendix 2) included DFO Science, DFO FAM, the Ekaluktutiak HTO and Kitikmeot Foods. The meeting generally followed the agenda outlined in Appendix 3. The meeting took place at the Arctic Island Lodge in Cambridge Bay and was convened on 27 January 2010 at 9:30 AM. A Research Document, summarizing relevant background information, was peer reviewed during the meeting and contents of the Science Advisory Report were thoroughly discussed. This proceedings report summarizes the meeting discussions and presents the key conclusions reached during the meeting.

DETAILED DISCUSSION

Following a round of introductions, the Chair provided a brief introduction to the meeting and a summary of the request for science advice from FAM. This was followed by a detailed overview of the role of the Ekaluktutiak HTO in the region summarized by the manager of the HTO. The science advisory process and purpose of the meeting was then explained by the Chair. A DFO participant gave a presentation on the fishery, including fishing locations in the region (Fig. 1), and highlighted the value of working with local fish harvesters and commercial plant members. The Chair provided an overview of the meeting agenda, which would consist of a detailed review of the working paper (i.e., draft Research Document), which once finalized will be published as a CSAS Research Document, followed by a brief discussion about what would be included in the Science Advisory Report.

ABSTRACT

Participants reviewed and agreed upon the content presented in the abstract. Minor editorial changes were suggested, but no major revisions were recommended. This assessment is based on a long time series dataset that spans over 40 years, which is rare, especially for Arctic fisheries.

INTRODUCTION

Participants reviewed the introduction of the draft Research Document and no concerns were raised.

THE FISHERY

No changes or revisions were recommended for the text in this section, though several lines of discussion and questions were raised. Participants were informed the subsistence harvest information came from the Nunavut Wildlife Harvest Study (Preist and Usher 2004). Some criticized the study and suggested that contracts be given to local people in the future to collect accurate site-specific harvest information about the magnitude of subsistence fishing near Cambridge Bay. Participants discussed whether gill nets or weirs are a better method for commercial fishing of Arctic Char. Weirs are efficient and result in better quality fish for the plant (e.g., no gill net marks). The plant pays more money for weir-captured fish therefore commercial fishers prefer to use that method if the option is available. In most circumstances, weirs are much more expensive. In the Cambridge Bay area, however, several traditional weirs exist on commercially-fished rivers. There was some discussion about the intermittency of some of these fisheries. Some river systems are too far from Cambridge Bay to fish on a regular basis. Additionally, it was mentioned that many of the systems were likely fished opportunistically while local harvesters are in the area conducting other activities (e.g., hunting and trapping). Local harvesters would return to fish systems that had high quality or quantity fish.

EVALUATION OF THE FISHERY ON STOCKS

Methods

Minor issues were raised by participants about the methods section. Clarification of the sample sizes used for the trends analyses is needed for each year within each river system assessed. It was recommended this information be summarized in a table or perhaps added directly into the figures that show trend analyses (i.e., trends in weight, age and condition). Net mesh size needs to be changed from 140 mm to the correct dimensions of 139.7 mm. It was suggested that more parameters be included in the calculations for the conversion factors. Although the draft Research Document graphically showed the effects of sampling year and location on the parameters of length, weight, age and condition, a participant recommended that a two-way ANOVA model be used to test for significance. This analysis was not done because the author felt that the graphic analyses (with confidence limits) adequately demonstrated the consensus of the rest of the committee which was that all fisheries showed stable trends. Furthermore, the author noted that the suggested model was not appropriate for autocorrelated data.

Abundance

Estimates of abundance are rarely available for Arctic Char fisheries, thus estimates of CPUE have to suffice as an index of abundance and for use in developing a Precautionary Approach model. Participants asked why historic catch-per-unit effort (CPUE) data were not available given that DFO had conducted research-based fisheries in the Cambridge Bay area in the past. It had not been possible to collect CPUE data with the available resources because the fishery has been conducted over an expansive area (i.e., up to 13 locations) using two types of gear (gillnets and weirs). The collection of abundance data can be an expensive and time consuming endeavour. Participants suggested implementing a program whereby catch and effort data are recorded as fishers bring their catch to the plant for processing. It was also suggested that log books be given to commercial fishermen so they can record their catch and effort at the time of fishing.

There was consensus among the meeting participants on the final content of the abundance section.

Age trends

Participants discussed the potential for ageing biases resulting from errors in fish ageing. This has been demonstrated in other assessments of Arctic Char. Reliable fisheries stock assessments and subsequent interpretations depend on accurate, consistent ageing. Ageing of Cambridge Bay Arctic Char had been consistent for this assessment. Participants asked about the method used to age the fish (e.g., otoliths aged whole or cross sectioned). An explanation of the ageing method will be included in the Research Document. A comparison of age data by gear type (gill net vs. weir) was proposed but rejected, given the limited data available for weir fisheries.

Population growth rates

Participants recommended pooling the growth data by 10-year intervals and re-analysing the data.

Length, weight and condition trends

No changes were suggested for these sections of the Research Document.

Sex and maturity

As almost all Arctic Char delivered to the fish plant are eviscerated, sex and maturity stage assessments could not be done for each year of the plant sampling program thus these datasets are intermittent. Participants recommended that the maturity data be uncombined and better described with respect to the sample sizes per fishing location. Fishing locations could be combined, if sample sizes are small, and maturity can be described per area.

Migration and spawning site fidelity

Participants suggested that molecular techniques be pursued to resolve migration (straying and thus gene flow) between river systems. Microsatellite DNA variation in Cambridge Bay Arctic Char could be valuable for providing insights into char migration between systems. Both historical and contemporary migration (i.e., gene flow) can be estimated using several methods and estimates of spawning site fidelity can be determined using a combination of contemporary gene flow estimates and assignment methods. It was concluded that a proposal to do such work should be submitted to the NWMB.

Stock structure

There are still many unknowns with regard to the stock structure of anadromous Cambridge Bay Arctic Char, again highlighting the importance of reassessing these stocks with more highly variable nuclear markers such as microsatellite DNA. Management problems associated with mixed-stock fisheries were also discussed. There are now several methods for resolving contributions to mixed-stock fisheries using microsatellite DNA that could provide insights into what populations are being harvested and to what extent. Given the importance of answering such questions, it was again agreed that a proposal be submitted to the NWMB to do this work.

The precautionary approach

Participants suggested that other potential models for management be discussed or at least mentioned.

SUMMARY AND CONCLUSIONS

Participants reviewed and agreed with the information presenting in the summary and conclusions section of the draft Research Document. They suggested including a point about the need for collection of CPUE data from both commercial and subsistence harvesters.

TABLES

It was suggested that age-at-first-maturity be added to Table 6 and, as mentioned above, that the maturity data be uncombined in Table 7 and presented by fishing location.

FIGURES

The only concern mentioned with respect to the figures was there should be no line visible in the trend figures (e.g., Figures 3, 4, 5 and 6) for years when there are no data available.

SCIENCE ADVISORY REPORT

Participants agreed on the contents of the Research Document that forms the basis of the Science Advisory Report (SAR).

In summary, during the meeting the participants concluded that 1) the harvested stocks are being fished at or below sustainable rates, 2) further research is required for the collection and analysis of catch per unit of effort data (CPUE), bycatch data, and standardization of weir and gillnet effort and 3) models such as virtual population analysis and surplus biomass be used, once CPUE data had been collected, to estimate abundance and a total allowable catch (TAC) and to estimate limit reference points for a Precautionary Approach (PA) model.

SOURCES OF INFORMATION

Day, A.C. and B. de March. 2004. Status of Cambridge Bay anadromous Arctic Char stocks. Can. Sci. Advis Sec. Res. Doc. 2004/052. ii + 78 p.

DFO. 2004. Cambridge Bay Arctic Char. DFO Can. Sci. Advis. Sec. Stock Status Rep. 2004/010.

Priest, H. and P.J. Usher. 2004. The Nunavut wildlife harvest study - final report. Unpubl. rep. prepared for the Nunavut Wildlife Management Board. 822 p.

APPENDIX 1. TERMS OF REFERENCE

Cambridge Bay Arctic Char Regional Advisory Meeting

January 27-28, 2010

Cambridge Bay, Nunavut
Chair: Theresa Carmichael

Background
Historically, in the Cambridge Bay area of Nunavut, commercial landings of Arctic Char (*Salvelinus alpinus*) have been harvested primarily from six stock complexes (Ekalluk, Paliryuak, Halovik, Lauchlan, Ellice and Jayco rivers). The Perry River was fished from 1977 to 1981 and in 1991 and has not been fished since. The Ellice River has not been fished since 1999. Other fishing sites have also been harvested occasionally but for four years or less at any given site (Kulgayuk River, Padliak and Elu Inlets and Starvation Cove). In 1988, a new fishery developed at HTA Lake (Takyoknitok) and has been fished sporadically since although not in recent years. The subsistence harvest of char is substantial, estimated to equal approximately one half the size of the commercial harvest, and probably is concentrated in areas close to Cambridge Bay such as from the Ekalluk River and Freshwater Creek.

The Cambridge Bay Arctic Char fishery was last assessed in 2004 (Day and de March 2004, DFO 2004). The fishery and its supporting stocks were considered stable and fished at or below their sustainable rates of harvest. All of the primary stock complexes were considered to have a low to moderate level of risk of over exploitation under current harvest regimes, with the exception of the Ellice River stock complex (DFO 2004).

Fisheries and Aquaculture Management Sector of Fisheries and Oceans Canada has requested science advice on the current status and sustainable harvest level for the Cambridge Bay commercial fishery.

Objectives
New information available since the previous assessment concerning the status of Arctic Char stocks for geographic stock complexes harvested from the Ekalluk, Paliryuak, Halovik, Lauchlan, Ellice and Jayco rivers will be presented and reviewed . The meeting will focus on the general status of these char stocks in regards to their response to harvest and identify any conservation issues. A precautionary approach model derived from analysis of long term plant sampling data will be presented and reviewed to providing reference points which would allow management of the Cambridge Bay Arctic Char fishery based on a precautionary approach.

Products
The meeting will generate a proceedings report summarizing the deliberations of the participants. This will be published in the Canadian Science Advisory Secretariat (CSAS) Proceedings Series. There will be CSAS Research Document(s) produced in relation to the working paper(s) presented and reviewed at the meeting. This will include the PA model developed and reviewed at the meeting. The advice from the meeting will be published as a Science Advisory Report.

Participants

Experts from DFO Science, Fisheries Management, the Nunavut Wildlife Management Board, Kitikmeot Foods of Cambridge Bay, the Ekaluktutiak Hunters and Trappers Organization as well as other have been invited to participate in this meeting.

References Cited

DFO, 2004. Cambridge Bay Arctic Char. DFO Can. Sci. Advis. Sec. Stock Status Rep. 2004/010.

Day, A.C. and de March B. 2004. Status of Cambridge Bay anadromous Arctic Char stocks. DFO Can. Sci. Advis. Sec. Res. Doc. 2004/052.

APPENDIX 2. LIST OF PARTICIPANTS

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APPENDIX 3. AGENDA

Regional Advisory Process for the Assessment of Cambridge Bay Arctic Char Commercial Fisheries

Arctic Islands Lodge, Cambridge Bay, NU

Day 1: 27 January 2010, from 9:00 a.m. to 5:00 p.m. (Central Daylight Time)

9:00 Introductions (round table)

9:10 Welcome and opening remarks by Theresa Carmichael

9:15 Introductions, review of agenda, RAP process explanation, responsibilities of participants and comments from participants

9:30 Review of the draft Research Document (i.e., the working paper), led by Chris Day

10:30 Abstract

10:40 Introduction

11:00 Coffee Break

11:10 The Fishery

12:00 Lunch

13:00 Methods

13:10 Abundance

13:30 Age Trends

13:40 Population Growth Rates

13:50 Length Trends

14:00 Weight Trends

14:30 Condition trends

14:45 Sex and Maturity

15:00 *Coffee break*

15:15 Migration and Spawning Site Fidelity

15:45 Stock Structure

13:55 The Precautionary Approach

16:10 Summary and Conclusions

16:30 Tables

16:45 Figures

17:00 Meeting adjourns

Day 2: 28 January 2010, from 9:00 a.m. to 11:00 a.m. (Central Daylight Time)

9:00 Introductions

9:15 Review of SAR content

10:45 Closing of meeting - summary of the editorial and approval process for Stock Advisory Report, Proceedings and Working Papers

11:00 Meeting adjourns